



Complete Summary

GUIDELINE TITLE

Chronic obstructive pulmonary disease.

BIBLIOGRAPHIC SOURCE(S)

Singapore Ministry of Health. Chronic obstructive pulmonary disease. Singapore: Singapore Ministry of Health; 2006 Oct. 84 p. [155 references]

GUIDELINE STATUS

This is the current release of the guideline.

The workgroup advises that these guidelines be scheduled for review three years after publication, or if new evidence appears that requires substantive changes to the recommendations.

** REGULATORY ALERT **

FDA WARNING/REGULATORY ALERT

Note from the National Guideline Clearinghouse: This guideline references a drug(s) for which important revised regulatory and/or warning information has been released.

- [May 2, 2007, Antidepressant drugs](#): Update to the existing black box warning on the prescribing information on all antidepressant medications to include warnings about the increased risks of suicidal thinking and behavior in young adults ages 18 to 24 years old during the first one to two months of treatment.

COMPLETE SUMMARY CONTENT

** REGULATORY ALERT **

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INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT

CATEGORIES

SCOPE

DISEASE/CONDITION(S)

Chronic obstructive pulmonary disease (COPD)

GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Risk Assessment
Treatment

CLINICAL SPECIALTY

Emergency Medicine
Family Practice
Geriatrics
Internal Medicine
Pharmacology
Pulmonary Medicine

INTENDED USERS

Physicians

GUIDELINE OBJECTIVE(S)

To give physicians a practical approach and guide to the care of chronic obstructive pulmonary disease (COPD) patients

TARGET POPULATION

Patients with known or suspected chronic obstructive pulmonary disease (COPD)

INTERVENTIONS AND PRACTICES CONSIDERED

Evaluation/Risk Assessment/Diagnosis

1. Evaluation of patients for chronic obstructive pulmonary disease (COPD) with identified risk factors
2. Bronchodilator reversibility testing to help identify some subjects with asthma or a large asthma component to COPD and to establish a patient's best attainable lung function
3. Arterial blood gases as indicated

4. Chest X-ray to exclude alternative diagnoses and to look for abnormalities that may suggest other conditions
5. Assessment of COPD disease severity based on response to bronchodilators or oral prednisolone, serial peak flow measurements, imaging or lung function testing
6. Spirometry for the definitive diagnosis of COPD and for the staging of disease severity
7. Classification of disease severity into 5 stages (0: at risk; I: mild; II: moderate; III: severe; IV: very severe)

Note: Guideline developers considered but did not recommend routine computed tomography of the chest

Management of Stable COPD

1. Pharmacotherapy
 - Inhaled short-acting bronchodilators
 - Inhaled long-acting bronchodilators
 - Inhaled long-acting bronchodilators in combination with short-acting inhaled bronchodilators
 - Theophylline alone or in combination with existing inhaled bronchodilator therapy
 - Inhaled corticosteroids in combination with long-acting beta₂-agonists
 - Vaccinations, including influenza and pneumococcal

Note: Guideline developers considered but recommended against long-term oral corticosteroids in stable COPD

2. Non-pharmacological management
 - Patient education
 - Smoking cessation
 - Nutrition
 - Pulmonary rehabilitation
 - Oxygen therapy
 - Surgery (bullectomy, lung volume reduction surgery [LVRS], lung transplantation)
 - Monitoring of patients with stable COPD

Management of Acute Exacerbations

1. Chest radiography to exclude other diagnoses
2. Pulse oximetry to identify patients with hypoxaemia
3. Pharmacological management
 - Inhaled anticholinergic bronchodilators or inhaled short-acting beta₂-agonists
 - Nebulisers and hand-held inhalers to achieve bronchodilation
 - Oral corticosteroids
 - Antibiotics as indicated
4. Non-pharmacological therapy
 - Oxygen therapy
 - Non-invasive ventilation in the hospital
 - Referral to Emergency Department (ED)

Note: Guideline developers considered but did not recommend sputum culture for routine investigation of patients with exacerbation.

Other Management Considerations

1. Assessment of appropriateness of COPD patients for air travel
2. Surgery considerations, including preoperative assessment, perioperative assessment, and postoperative management
3. End of life care

MAJOR OUTCOMES CONSIDERED

- Diagnostic and prognostic utility of tests
- Efficacy of management/treatment strategies on:
 - Symptoms
 - Exercise capacity
 - Frequency and severity of acute exacerbations
 - Health-related quality of life
 - Progression of disease
 - Pulmonary function
 - Survival
- Side effects and complications of treatments

METHODOLOGY

METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

NUMBER OF SOURCE DOCUMENTS

Not stated

METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

Level 1++: High quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias.

Level 1+: Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.

Level 1-: Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias

Level 2++: High quality systematic reviews of case control or cohort studies. High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal

Level 2+: Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal

Level 2-: Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal

Level 3: Non-analytic studies (e.g. case reports, case series)

Level 4: Expert opinion

METHODS USED TO ANALYZE THE EVIDENCE

Review of Published Meta-Analyses
Systematic Review

DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Grades of Recommendation

Grade A: At least one meta-analysis, systematic review of randomized controlled trials (RCTs), or RCT rated as 1++ and directly applicable to the target population; or

A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results

Grade B: A body of evidence including studies rated as 2++, directly applicable to the target population, and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 1++ or 1+

Grade C: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 2++

Grade D: Evidence level 3 or 4; or

Extrapolated evidence from studies rated as 2+

GPP (good practice points): Recommended best practice based on the clinical experience of the guideline development group.

COST ANALYSIS

Cost-effectiveness of Pharmacotherapy in Chronic Obstructive Pulmonary Disease (COPD)

A methodological critique of seven pharmacoeconomic studies on maintenance therapy for COPD showed tiotropium to be considered cost-effective relative to ipratropium, and inhaled corticosteroids to be cost-effective for patient with moderate to severe COPD relative to standard care. No conclusive information could be reached for the cost-effectiveness of long-acting beta₂-agonists.

Variations in drug costs and primary and tertiary healthcare costs make it difficult to extrapolate the findings of cost-effectiveness analyses in other healthcare settings to the local situation.

Cost-effectiveness of Smoking Interventions

Studies done in the United States on the cost effectiveness of the clinical practice recommendation in the Agency for Health Care Policy and Research (AHCPR) guideline for smoking cessation showed: the average cost per quitter was US \$3,779; the average cost per life-year saved, US \$2,587; and the average cost per QALY (quality-adjusted life-year) saved, US \$1,915.91.

METHOD OF GUIDELINE VALIDATION

Not stated

DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

RECOMMENDATIONS

MAJOR RECOMMENDATIONS

The recommendations that follow are those from the guideline's executive summary; detailed recommendations can be found in the original guideline document. Each recommendation is rated based on the level of the evidence and the grades of recommendation. Definitions of the grades of the recommendations (A, B, C, D, and Good Practice Point [GPP]) and level of the evidence (Level 1++, 1+, 1-, 2++, 2+, 2-, 3, 4) are presented at the end of the "Major Recommendations" field.

Definition, Differential Diagnosis and Classification of Severity

D - Where diagnostic doubt remains, or both chronic obstructive pulmonary disease (COPD) and asthma are present, the following findings will help identify asthma (National Collaborating Centre for Chronic Conditions, National Institute for Health and Clinical Excellence [NICE], 2004):

- A large response (FEV_1 greater than 400 ml) to bronchodilators.
- A large response (FEV_1 greater than 400 ml) to 30 mg oral prednisolone daily for 2 weeks.
- Serial peak flow measurements showing 20% or greater diurnal or day-to-day variability. (**Grade D, Level 4**)

Table 3: Classification of Severity*

Stage	Characteristics
0: At Risk	normal Spirometry chronic symptoms (cough, sputum production)
I: Mild COPD	$FEV_1/FVC < 70\%$ $FEV_1 \geq 80\%$ predicted with or without chronic symptoms (cough, sputum production)
II: Moderate COPD	$FEV_1/FVC < 70\%$ $50\% \leq FEV_1 < 80\%$ predicted with or without chronic symptoms (cough, sputum production)
III: Severe COPD	$FEV_1/FVC < 70\%$ $30\% \leq FEV_1 < 50\%$ predicted with or without chronic symptoms (cough, sputum production)
IV: Very Severe COPD	$FEV_1/FVC < 70\%$ $FEV_1 < 30\%$ predicted or $FEV_1 < 50\%$ predicted plus chronic respiratory failure
*Classification based on postbronchodilator FEV_1	
FEV_1 : forced expiratory volume in one second; FVC: forced vital capacity; respiratory failure: arterial partial pressure of oxygen (PaO_2) less than 8.0 kPa (60 mm Hg) with or without arterial partial pressure of CO_2 ($PaCO_2$) greater than 6.7 kPa (50 mm Hg) while breathing air at sea level.	

(Source: Global Initiative for Chronic Obstructive Pulmonary Disease [GOLD], 2005)

Evaluation

D - A diagnosis of COPD should be considered in any patient more than 35 years old, who has chronic cough, sputum production, or dyspnoea, and/or a history of exposure to risk factors for the disease (see Table 4 in the original guideline document) (GOLD/WHO/NHLBI, 2003). (**Grade D, Level 4**)

D - Spirometry is useful for the definitive diagnosis of COPD and for the staging of disease severity and should be performed in individuals with symptoms suggestive of COPD (GOLD/WHO/NHLBI, 2003). (**Grade D, Level 4**)

D - It is also recommended that bronchodilator reversibility testing be performed to help identify some subjects with asthma or a large asthma component to COPD (Kesten & Chapman, 1993) and to establish a patient's best attainable lung function (GOLD/WHO/NHLBI, 2003). (**Grade D, Level 4**)

D - Arterial blood gases should be performed in patients with $FEV_1 < 40\%$ predicted or with clinical signs suggestive of respiratory failure or right heart failure (GOLD/WHO/NHLBI, 2003). (**Grade D, Level 4**)

D - A chest X-ray is seldom diagnostic in COPD but it is valuable in excluding alternative diagnoses and should be performed to look for abnormalities that may suggest other conditions. Computed tomography of the chest is not routinely recommended (GOLD/WHO/NHLBI, 2003). (**Grade D, Level 4**)

Pharmacotherapy for Stable COPD

A - Inhaled short-acting bronchodilators are recommended as first-line therapy in all stages of COPD to relieve symptoms and improve exercise capacity. (**Grade A, Level 1+**)

A - Regular treatment with one or both classes of the inhaled long-acting bronchodilators should be considered for patients with moderate to very severe COPD with frequent exacerbations. (**Grade A, Level 1+**)

D - Inhaled long-acting bronchodilators may be added to the treatment regimen when symptoms are not controlled with short-acting inhaled bronchodilators alone (Global Initiative for Chronic Obstructive Lung Disease [GOLD], 2005; NICE, 2004). (**Grade D, Level 4**)

D - Theophylline may be a useful addition where symptom control is still not achieved with existing inhaled bronchodilator therapy. Theophylline may be of value for patients who are non-adherent to or unable to use inhaled therapy (Global Initiative for Chronic Obstructive Lung Disease, 2005). (**Grade D, Level 4**)

A - Inhaled corticosteroids as long-term maintenance therapy are recommended for patients with $FEV_1 < 50\%$ predicted who experience frequent exacerbations. (**Grade A, Level 1+**)

A - Long-term oral corticosteroids are not recommended in stable COPD (Walters, Walters, & Wood-Baker, 2005). (**Grade A, Level 1+**)

D - Combination inhaled corticosteroids and long-acting β_2 -agonists should be considered for patients in whom both its components are indicated (Global Initiative for Chronic Obstructive Lung Disease, 2005). (**Grade D, Level 4**)

C - Annual influenza vaccination should be offered to the elderly (65 years and above) in all stages of COPD. (**Grade C, Level 2++**)

D - Pneumococcal vaccination may be considered in COPD patients (NICCCC/NICE, 2004) (**Grade D, Level 4**)

D - If considering pneumococcal vaccination for a COPD patient, usually only one dose of the vaccine is needed. A second dose is recommended for persons aged 65 or older who received their first dose when they were under 65, if 5 or more years have passed since that dose (Centers for Disease Control and Prevention, 1997). (**Grade D, Level 4**)

Table 7 Recommended Pharmacotherapy in Stable COPD

Symptoms	Exacerbations	Spirometry	Recommended Pharmacotherapy
Intermittent	AND Few exacerbations	Regardless of FEV_1	SABA or Combination SABA/SAAC inhaler as needed for symptom relief
			SABA as needed for symptom relief
Persistent*	AND/OR Frequent exacerbations#	AND $FEV_1 \geq 50\%$ predicted	With one of the following: 1. SAAC 4 to 6 hourly or 2. Combination SABA/SAAC inhaler 4 to 6 hourly or 3. Long-acting anticholinergic (LAAC) once daily** to which may be added: Long-acting β_2 agonist (LABA) 12 hourly** AND/OR Sustained-release theophylline 12 hourly or once daily**

Symptoms	Exacerbations	Spirometry	Recommended Pharmacotherapy
Intermittent or Persistent	AND Frequent exacerbations	AND FEV ₁ <50% predicted	As above AND Inhaled corticosteroids

SABA = short-acting beta₂-agonist
SAAC = short-acting anti-cholinergic

* Persistent symptoms: exertional dyspnoea, diminished exercise capacity, persistent cough, wheeze despite SABA/combination SABA/SAAC inhaler as needed.

#Frequent exacerbations: two or more acute exacerbations a year requiring systemic steroids.

****GPP** The choice between LAAC, LABA or theophylline is dependent on the individual patient's response in terms of symptom relief and side-effects, and affordability of the medication. This should be re-evaluated if there is lack of therapeutic response. (**GPP**)

Non-pharmacological Management for Stable COPD

Patient Education

D - Patient education is a vital part of COPD management and should begin at the time of first assessment for COPD and continue with each follow-up visit (Pauwels et al., 2001; "Strategies in preserving lung health," 1998). (**Grade D, Level 4**)

D - The intensity and content of patient educational messages should vary depending on the severity of the patient's disease (see Table 8 below).

Table 8 Recommended Topics for Patient Education According to Severity of Disease

Severity of Disease	Patient Education Topic
Stage 0: At Risk	Information and advice about reducing risk factors.
Stage I: Mild COPD through Stage III: Severe COPD	<p>Above topic, plus:</p> <ul style="list-style-type: none"> • Information about the nature of COPD. • Instruction on how to use inhalers and nebuliser. • Information on influenza vaccination and medication. • Recognition and treatment of exacerbation. • Strategies for minimizing dyspnea • Information on pulmonary rehabilitation.

Severity of Disease	Patient Education Topic
Stage IV: Very Severe COPD	Above topic, plus: Information about complications. Information about oxygen treatment. Advance directive and end-of-life decisions.

[Source: Global Initiative for Chronic Obstructive Lung Disease (GOLD), 2005]

(Grade D, Level 4)

D - Patient education should be (Pauwels et al., 2001):

- Tailored to meet the needs of the individual patient
- Interactive
- Directed to improving quality of life
- Simple to follow
- Practical
- Appropriate to the intellectual and social skill of the patient and the caregivers

(Grade D, Level 4)

Smoking Cessation

A - Smoking cessation should be emphasized as an essential first step in management of COPD patients (Anthonisen et al., 1994; Doll et al., 1994; "Global Initiative for Chronic Obstructive Lung Disease," 2001; Xu X et al., 1992; Scanlon et al., 2000; Anthonisen, Connett, & Murray, 2002). **(Grade A, Level 1++)**

GPP - Clinicians should play a prominent role in promoting attempts to stop smoking in their patients. **(GPP)**

A - All smokers, including those who may be at risk for COPD as well as those who already have the disease, should be offered at least a brief tobacco dependence counseling at every health care provider visit ("Global Initiative for Chronic Obstructive Lung Disease," 2001; Wilson et al., 1990; Britton & Knox, 1999). **(Grade A, Level 1++)**

D - Pharmacotherapy for smoking cessation is recommended when counseling is not sufficient to help patients quit smoking ("Global Initiative for Chronic Obstructive Lung Disease," 2001). **(Grade D, Level 4)**

A - Treatment of nicotine dependence is effective and should be offered to smokers in addition to counselling (Britton & Knox, 1999; Jorenby et al., 1999; Kottke et al., 1988; Silagy et al., 2001; Fiore et al., 1994; Lancaster et al., 2000; Baillie et al., 1994). **(Grade A, Level 1++)**

A - These pharmacotherapies reliably increase long-term smoking abstinence rates (Wilson et al., 1990; Britton & Knox, 1999; "A clinical practice guideline," 2000; Jorenby et al., 1999; Kottke et al., 1988; Silagy et al., 2001; Fiore et al., 1994; Lancaster et al., 2000; Baillie et al., 1994; Ockene et al., 1991; Russell et al., 1993; Tang, Law, & Law, 1994; Silagy et al., 1994; Lam et al., 1987; Tashkin

et al., 2001; Fiore, Jorenby, & Baker, 1992; Buist et al., 1976) and at least one of these medications should be added to counseling if necessary and in the absence of contraindications ("Global Initiative for Chronic Obstructive Lung Disease," 2001; "A clinical practice guideline," 2000). (**Grade A, Level 1++**)

Nutrition in COPD

D - All patients with COPD should undergo simple nutrition screening. (**Grade D, Level 4**)

GPP - Nutritional intervention should be considered in all COPD patients with BMI <18.5 kg/m² or significant involuntary weight loss (>10% during the last 6 months or >5% in the past month). (**GPP**)

Pulmonary Rehabilitation

D - Pulmonary rehabilitation may be considered for patients with the following ("Pulmonary Rehabilitation," 1999; Puhan et al., 2005; Salman et al., 2003):

- Persistent symptoms especially dyspnoea
- Reduced exercise tolerance or experience a restriction in activities
- Recurrent admissions to hospitals over the last 6 months

(**Grade D, Level 4**)

B - The physical components of pulmonary rehabilitation should include both lower extremity training (e.g., bicycle, ergometry, treadmill) and upper extremity training (strength and endurance) ("Pulmonary rehabilitation: joint ACCP/AACVPR evidence-based Guidelines," 1997). (**Grade B, Level 2+**)

D - Psychosocial and behavioral interventions (health education, smoking cessation clinic, and support groups addressing psychosocial issues) as well as nutritional intervention should also be included as non-physical components of the comprehensive pulmonary rehabilitation programs ("Pulmonary Rehabilitation," 1999). (**Grade D, Level 4**)

Oxygen Therapy in Chronic Obstructive Pulmonary Disease

A - Patients with very severe COPD and chronic respiratory failure should be assessed for the need for long-term oxygen therapy. (**Grade A, Level 1+**)

A - Indications for long-term oxygen therapy (at least 15 hours/day) in patients with COPD should be based on the following indices obtained in stable state ("Long term domiciliary oxygen therapy," 1981; "Continuous or nocturnal oxygen therapy," 1980):

- Without pulmonary hypertension (Cor Pulmonale), congestive heart failure, polycythaemia (Hct >55%):
 1. PaO₂ ≤ 55 mmHg on Room Air

OR

- 2. $\text{SaO}_2 \leq 89\%$ on Room Air
- With pulmonary hypertension (Cor Pulmonale), congestive heart failure, polycythaemia (Hct $>55\%$):

1. PaO_2 between 55 mmHg – 60 mmHg on Room Air

OR

2. $\text{SaO}_2 \leq 89\%$ on Room Air

(Grade A, Level 1+)

D - Oxygen concentrator is the preferred mode of delivery of oxygen. It is the most convenient and economical method of providing long-term oxygen therapy (Heaney, McAllister, & MacMahon, 1999). **(Grade D, Level 3)**

D - Very severe COPD patients with hypercapnic respiratory failure requiring long-term oxygen therapy should have the oxygen flow rate titrated cautiously to maintain a $\text{SaO}_2 \geq 90\%$ (NICCCC/NICE, 2004). **(Grade D, Level 4)**

Monitoring of Patients with Stable COPD

D & GPP - Patients should be seen and assessed regularly (e.g. three monthly in the stable state) (NICCCC/NICE, 2004).

At each follow-up visit:

- Patients should be asked regarding onset of any new symptoms and/or worsening of exercise capacity.
- Current smokers should be given repeated advice to quit.
- Adherence to medications should be assessed, and the patient's inhaler technique checked and re-taught if necessary.

(Grade D, Level 4/GPP)

D & GPP - Indications for specialist referral (NICCCC/NICE, 2004).

- Severe COPD ($\text{FEV}_1 < 50\%$ predicted).
- Frequent exacerbations (e.g. two or more a year) despite compliance to treatment.
- Rapidly progressive course of the disease.
- Development of new symptoms (e.g. haemoptysis) or new physical signs (e.g. cyanosis, peripheral oedema)

(Grade D, Level 4/GPP)

Management of Acute Exacerbations

C - Chest radiography is recommended in an acute exacerbation, when other diagnoses like pneumonia or heart failure need to be excluded (Bach et al., 2001). (**Grade C, Level 2+**)

D - Sputum culture is not recommended for routine investigation of patients with exacerbation (NICCCC/NICE, 2004). (**Grade D, Level 3**)

D - Pulse oximetry, if available, can assist doctors in identifying patients with hypoxaemia when oxygen saturation (SaO₂) is less than 90% (NICCCC/NICE, 2004). (**Grade D, Level 3**)

Pharmacological Management

A - Inhaled anticholinergic bronchodilators or inhaled short-acting beta₂-agonists are beneficial and should be used in the treatment of patients presenting with acute exacerbation of COPD (Shrestha et al., 1991). (**Grade A, Level 1+**)

D - Both nebulisers and hand-held inhalers can be used to administer inhaled therapy during exacerbations of COPD, as they are equally effective in achieving bronchodilation in COPD exacerbations (Boe et al., 2001). (**Grade D, Level 4**)

A - In the absence of significant contraindications, oral corticosteroids should be used, in conjunction with other therapies, in all patients admitted to hospital with an exacerbation of COPD (Neiwoehner et al., 1999). (**Grade A, Level 1+**)

A - In the absence of significant contraindications, oral corticosteroids should be considered in patients managed in the community who have an exacerbation with a significant increase in the breathlessness which interferes with daily activities (Neiwoehner et al., 1999). (**Grade A, Level 1+**)

A - Prednisolone 30 mg orally should be prescribed for 7 to 14 days to patients with an exacerbation. It is recommended that a course of corticosteroid treatment should not be longer than 14 days as there is no advantage in prolonged therapy (Neiwoehner et al., 1999). (**Grade A, Level 1+**)

A - Antibiotics should be used to treat exacerbations of COPD when (Saint et al. 1995):

1. There is history of purulent sputum
2. There are clinical signs of pneumonia
3. There is consolidation on a chest radiograph

(**Grade A, Level 1+**)

Non-pharmacological Therapy

GPP - Oxygen therapy should be considered if patient is known, or suspected, to have hypoxaemia. This can be administered via nasal prongs, or venturi mask. One should exercise caution in the oxygen dose for patients, such that the lowest possible oxygen concentration to maintain oxygen saturation above 90% is provided. If pulse oximetry is not available, the concentration of the oxygen mask

should not exceed 28%, or the nasal prong oxygen flow rate should be kept at 2L/min. (**GPP**)

A - Non-invasive ventilation should be used as the treatment of choice in the hospital, for persistent hypercapnic ventilatory failure during exacerbations despite optimal medical therapy (Lightowler et al., 2003). (**Grade A, Level 1+**)

When to Refer to the Emergency Department (ED)

GPP - Any one of the following signs may indicate severe exacerbations requiring urgent referral to the Emergency Department:

1. Marked dyspnoea and tachypnoea (> 30 respirations/minute)
2. Use of accessory muscles (sternomastoid and abdominal) at rest
3. Cyanosis
4. Confusion
5. SaO₂ <90%

(**GPP**)

Air Travel

D - Patients with severe COPD, history of air travel intolerance with respiratory symptoms (dyspnoea, chest pain, confusion, syncope), comorbidity with other conditions worsened by hypoxaemia (cerebrovascular disease, coronary artery disease, heart failure), and recent pneumothorax should undergo assessment before flying (British Thoracic Society, 2002).

The following assessment is recommended (British Thoracic Society, 2002):

- History and examination with particular reference to cardiorespiratory disease, dyspnoea and previous flying experience
- Spirometry (in non-tuberculous patients only)
- Measurement of SpO₂ by pulse oximetry. Readings should be taken from a warm ear or finger after sufficient delay for the oximeter to display a stable reading. Blood gases are preferred if hypercapnia is known or suspected

(**Grade D, Level 4**)

D - Patients who have resting sea level oximetry between 92% and 95% and who have additional risk factors (Table 9) should be referred for further assessment. (**Grade D, Level 4**)

Surgery in COPD Patients

GPP - Preoperative assessment of a COPD patient should include:

1. Detailed history and physical examination
2. Assessment of functional capacity (American Society of Anesthesiology Physical Status Scale). See Table 10.
3. Preoperative Spirometry

4. Arterial Blood Gas especially in moderate to severe COPD
5. Chest Radiograph

(GPP)

A - COPD patients being considered for surgery should be assessed for risk of developing venous thromboembolism and also for thromboprophylaxis during the perioperative assessment (Haas, 2002). (**Grade A, Level 1+**)

A - Combination of bronchodilators, chest physiotherapy, antibiotics, smoking cessation for at least 4 to 8 weeks and a short course of oral corticosteroids should be given for patients with acute exacerbation so as to reduce the risk of postoperative pulmonary complications (Shrestha et al., 1991; Neiwoehner et al., 1999; Saint et al., 1995). (**Grade A Level 1+**)

End of Life Care in COPD

Patients should be educated about their disease, prognosis and possible circumstances of death. (**Grade D, Level 3**)

D - Physicians should discuss end of life issues and advance care planning with patients (and their relatives) who have severe to very severe COPD. (**Grade D, Level 3**)

B - Physicians who look after severe to very severe COPD patients (as with all physicians caring for the terminally ill) will need to be prepared to discuss end of life issues with patients. (**Grade B, Level 1+**)

Definitions:

Grades of Recommendations

Grade A: At least one meta-analysis, systematic review of randomized controlled trials (RCTs), or RCT rated as 1+ + and directly applicable to the target population; or

A body of evidence consisting principally of studies rated as 1+, directly applicable to the target population, and demonstrating overall consistency of results

Grade B: A body of evidence including studies rated as 2+ +, directly applicable to the target population, and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 1+ + or 1+

Grade C: A body of evidence including studies rated as 2+, directly applicable to the target population and demonstrating overall consistency of results; or

Extrapolated evidence from studies rated as 2+ +

Grade D: Evidence level 3 or 4; or

Extrapolated evidence from studies rated as 2+

GPP (good practice points): Recommended best practice based on the clinical experience of the guideline development group.

Levels of Evidence

Level 1++: High quality meta-analyses, systematic reviews of randomized controlled trials (RCTs), or RCTs with a very low risk of bias.

Level 1+: Well conducted meta-analyses, systematic reviews of RCTs, or RCTs with a low risk of bias.

Level 1-: Meta-analyses, systematic reviews of RCTs, or RCTs with a high risk of bias

Level 2++: High quality systematic reviews of case control or cohort studies. High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal

Level 2+: Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal

Level 2-: Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal

Level 3: Non-analytic studies (e.g. case reports, case series)

Level 4: Expert opinion

CLINICAL ALGORITHM(S)

An algorithm is provided in the original guideline document for the management of an acute exacerbation.

EVIDENCE SUPPORTING THE RECOMMENDATIONS

REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see "Major Recommendations" field).

BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

POTENTIAL BENEFITS

Appropriate diagnosis and management of patients with chronic obstructive pulmonary disease (COPD)

POTENTIAL HARMS

- Side effects of medication
- Complications related to surgery
- Risk of fire and explosion when using oxygen therapy. Patients requiring oxygen therapy should be advised against smoking cigarettes.

CONTRAINDICATIONS

CONTRAINDICATIONS

Contraindications to specific surgeries (bullectomy, lung volume reduction surgery [LVRS]), and lung transplantation are listed in the original guideline document.

QUALIFYING STATEMENTS

QUALIFYING STATEMENTS

- These guidelines are not intended to serve as a standard of medical care. Standards of medical care are determined on the basis of all clinical data available for an individual case and are subject to change as scientific knowledge advances and patterns of care evolve.
- The contents of this publication are guidelines to clinical practice, based on the best available evidence at the time of development. Adherence to these guidelines may not ensure a successful outcome in every case. These guidelines should neither be construed as including all proper methods of care, nor exclude other acceptable methods of care. Each physician is ultimately responsible for the management of his/her unique patient, in the light of the clinical data presented by the patient and the diagnostic and treatment options available.
- Evidence-based clinical practice guidelines are only as current as the evidence that support them. Users must keep in mind that new evidence could supersede recommendations in these guidelines.

IMPLEMENTATION OF THE GUIDELINE

DESCRIPTION OF IMPLEMENTATION STRATEGY

The workgroup proposes some possible clinical quality indicators, based on recommendations in these guidelines, that healthcare providers may use in monitoring their practice and to better gauge their quality of care.

Quality Indicators	Recommended Minimum Frequency*	Examples of Suggested Measurable Indicators
Smoking	Annual	Percentage of chronic obstructive pulmonary

Quality Indicators	Recommended Minimum Frequency*	Examples of Suggested Measurable Indicators
		disease (COPD) patients whose smoking habits and desire to quit were assessed on ≥ 1 occasions in the past one year (except for those who have never smoked where smoking habits should be recorded once)
Inhaler technique	Annual	Percentage of COPD patients who have a record of inhaler technique assessment in the past one year
Weight or BMI	Annual	Percentage of COPD patients who have a record of weight or BMI assessment in the past one year
Influenza vaccination	Annual	Percentage of COPD patients who have a record of influenza vaccination being offered in the past one year

*Users may consider allowing an added margin of time (e.g. +3 months) when assessing adherence to recommended annual frequencies.

IMPLEMENTATION TOOLS

Audit Criteria/Indicators
Clinical Algorithm
Personal Digital Assistant (PDA) Downloads
Quick Reference Guides/Physician Guides
Slide Presentation
Staff Training/Competency Material

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

IOM CARE NEED

End of Life Care
Getting Better
Living with Illness
Staying Healthy

IOM DOMAIN

Effectiveness
Patient-centeredness

IDENTIFYING INFORMATION AND AVAILABILITY

BIBLIOGRAPHIC SOURCE(S)

Singapore Ministry of Health. Chronic obstructive pulmonary disease. Singapore: Singapore Ministry of Health; 2006 Oct. 84 p. [155 references]

ADAPTATION

Not applicable: The guideline was not adapted from another source.

DATE RELEASED

2006 Oct

GUIDELINE DEVELOPER(S)

Singapore Ministry of Health - National Government Agency [Non-U.S.]

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Singapore Ministry of Health

GUIDELINE COMMITTEE

Workgroup on Chronic Obstructive Pulmonary Disease

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FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

GUIDELINE STATUS

This is the current release of the guideline.

The workgroup advises that these guidelines be scheduled for review three years after publication, or if new evidence appears that requires substantive changes to the recommendations.

GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the [Singapore Ministry of Health Web site](#).

Print copies: Available from the Singapore Ministry of Health, College of Medicine Building, Mezzanine Floor 16 College Rd, Singapore 169854.

AVAILABILITY OF COMPANION DOCUMENTS

The following is available:

- Chronic obstructive pulmonary disease summary card. 2006 Apr. 16 p. Available in Portable Document Format (PDF) from the [Singapore Ministry of Health Web site](#).
- Chronic obstructive pulmonary disease, slide & speeches. Nov 2006. Available from the [Singapore Ministry of Health Web site](#).

The following are also available:

- Audit criteria and a continuing medical education (CME) self assessment are available in the [original guideline document](#).
- The full text guideline and summary card are available for PDA download in ISilo and MSReader formats from the [Singapore Ministry of Health Web site](#).

PATIENT RESOURCES

None available

NGC STATUS

This NGC summary was completed by ECRI on January 16, 2007. This summary was updated by ECRI Institute on November 9, 2007, following the U.S. Food and Drug Administration advisory on Antidepressant drugs.

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